

**U.S.ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY
540 S. MORRIS AVE., MONTGOMERY, AL 36115
ALPBET ANALYSES**

REPORT OF SAMPLE DELIVERY GROUP #1200002

Project: Dimock Residential GW Site, Dimock, PA
Analysis method: Gross Alpha and Beta on Water Samples
Report ID: 1200002-ALPBET
Report type: Original
Date reported: 04/05/2012
Total pages in report: 21

SAMPLES

NAREL Sample #	Client Sample ID	Location	Matrix	Date Collected	Date Received
B2.02559T	FB19	PA:DIMOCK	WATER-DRINKING	03/05/2012	03/07/2012
B2.02560K	HW56	PA:DIMOCK	WATER-DRINKING	03/05/2012	03/07/2012
B2.02561L	HW60	PA:DIMOCK	WATER-DRINKING	03/05/2012	03/07/2012
B2.02617K	FB20	PA:DIMOCK	WATER-DRINKING	03/06/2012	03/08/2012
B2.02618L	HW61	PA:DIMOCK	WATER-DRINKING	03/06/2012	03/08/2012
B2.02619M	HW61Z	PA:DIMOCK	WATER-DRINKING	03/06/2012	03/08/2012
B2.02675W	FB21	PA:DIMOCK	WATER-DRINKING	03/08/2012	03/09/2012
B2.02676X	HW50	PA:DIMOCK	WATER-DRINKING	03/08/2012	03/09/2012

EXCEPTIONS

1. **Packaging and shipping** – No problems were observed.
2. **Documentation** – No problems were observed.
3. **Sample preparation** – No problems were encountered.
4. **Analysis** – No problems were encountered.
5. **Holding times** – No holding times were specified.

QUALITY CONTROL

1. **QC samples** – All QC analysis results met NAREL acceptance criteria.
2. **Instruments** – Response and background checks for all instruments used in these analyses met NAREL acceptance criteria.

CERTIFICATION

I certify that this data report complies with the terms and conditions of the Quality Assurance Project Plan, except as noted above. Release of the data contained in this report has been authorized by the Director of the Center for Environmental Radioanalytical Laboratory Science and the NAREL Quality Assurance Manager, or their designees, as verified by the following signatures.



Mary F. Wisdom
Quality Assurance Manager, NAREL

4-10-12

Date

 (Acting CERLS Dir)

John G. Griggs, Ph.D.
Director, Center for Environmental Radioanalytical
Laboratory Science

4-11-12

Date

GENERAL INFORMATION

SAMPLE TYPES

BLD	Blind sample
FBK	Field blank
SAM	Normal sample

ANALYSIS QC TYPES

ANA	Normal analysis
DUP	Laboratory duplicate
LCS	Laboratory control sample (blank spike)
MS	Matrix spike
MSD	Matrix spike duplicate
RBK	Method blank

QUALITY INDICATORS

RPD	Relative Percent Difference
%R	Percent Recovery
Z	Number of standard deviations by which a QC measurement differs from the expected value

EVALUATION OF QC ANALYSES

A method blank result is considered unacceptable if it is more than 3 standard deviations below zero or more than 3 standard deviations above a predetermined upper control limit. For some analyses NAREL has set the upper control limit at zero. For others the control limit is a small positive number.

NAREL evaluates the results of duplicate and spike analyses using "Z scores." A Z score is the number of standard deviations by which the QC result differs from its ideal value. The score is considered acceptable if its absolute value is not greater than 3.

The Z score for a spiked sample is computed by dividing the difference between the measured value and the target value by the combined standard uncertainty of the difference.

The Z score for a duplicate analysis is computed by dividing the difference between the two measured values by the combined standard uncertainty of the difference. When the precision of paired MS/MSD analyses is evaluated, the native sample activity is subtracted from each measured value and the net concentrations are then converted to total activities before the Z score is computed.

Each standard uncertainty used to compute a Z score includes an additional fixed term to represent sources of measurement error other than counting error. This additional term is not used in the evaluation of reagent blanks.

NAREL reports the "relative percent difference," or RPD, between duplicate results and the "percent recovery," or %R, for spiked analyses, but does not use these values for evaluation.

GENERAL INFORMATION (CONTINUED)

GROSS ALPHA AND BETA ANALYSIS

In comparison to the methods employed to determine radionuclide-specific activities, the method employed by NAREL to determine gross alpha and beta activity in water samples has the potential for greater analytical bias. It should be noted that this potential analytical uncertainty is not included in the two-sigma counting uncertainty term. Therefore, gross alpha and beta results should be used as gross approximations of the alpha and beta activity present.

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SDG #1200002

ANALYSIS SUMMARY

Analysis Procedure: NAREL GR-01
Title: Gross Alpha and Beta on Water Samples

NAREL Sample #	QC Type	Preparation Procedure	Date Completed	Assay Batch #	QC Batch #
B2.02559T	DUP	N/A	03/26/2012	0015841N	0008587R
B2.02560K		N/A	03/26/2012	0015841N	0008587R
B2.02561L		N/A	03/26/2012	0015841N	0008587R
B2.02561L		N/A	03/26/2012	0015841N	0008587R
B2.02617K	MS	N/A	03/26/2012	0015841N	0008587R
B2.02617K		N/A	03/26/2012	0015841N	0008587R
B2.02618L		N/A	03/26/2012	0015841N	0008587R
B2.02619M		N/A	03/26/2012	0015841N	0008587R
B2.02675W	LCS	N/A	03/26/2012	0015841N	0008587R
B2.02676X		N/A	03/26/2012	0015841N	0008587R
LCS-00634195B *		N/A	03/26/2012	0015841N	0008587R
RBK-00634196C *		N/A	03/26/2012	0015841N	0008587R

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

PREPARATION METHOD(S) USED

Procedure ID	Title

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SAMPLE ANALYSIS REPORT

Sample #:	B2.02559T	QC batch #:	0008587R
Matrix:	WATER-DRINKING	Assay batch #:	0015841N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL GR-01
Dry/wet weight:	N/A	Analyst:	CHD
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	Aqueous		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/26/2012 14:58	100.0	GQ2A	GVJ

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Alpha	5.70e-03	9.6e-01	8.7e-01	PCI/L	03/26/2012 14:58 CDT
Beta	2.79e-01	1.0e+00	1.6e+00	PCI/L	03/26/2012 14:58 CDT

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SAMPLE ANALYSIS REPORT

Sample #:	B2.02560K	QC batch #:	0008587R
Matrix:	WATER-DRINKING	Assay batch #:	0015841N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.000e-01 L	Analysis procedure:	NAREL GR-01
Dry/wet weight:	N/A	Analyst:	CHD
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/26/2012 14:58	100.0	GQ2B	GVJ

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Alpha	2.23e+00	2.1e+00	1.5e+00	PCI/L	03/26/2012 14:58 CDT
Beta	2.83e+00	1.7e+00	2.4e+00	PCI/L	03/26/2012 14:58 CDT

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SDG #1200002

SAMPLE ANALYSIS REPORT

Sample #:	B2.02561L	QC batch #:	0008587R
Matrix:	WATER-DRINKING	Assay batch #:	0015841N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 L	Analysis procedure:	NAREL GR-01
Dry/wet weight:	N/A	Analyst:	CHD
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/26/2012 14:58	100.0	GQ2C	GVJ

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Alpha	2.48e+00	3.9e+00	3.1e+00	PCI/L	03/26/2012 14:58 CDT
Beta	2.29e+00	2.9e+00	4.5e+00	PCI/L	03/26/2012 14:58 CDT

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SDG #1200002

SAMPLE ANALYSIS REPORT

Sample #:	B2.02561L	QC batch #:	0008587R
Matrix:	WATER-DRINKING	Assay batch #:	0015841N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.000e-01 L	Analysis procedure:	NAREL GR-01
Dry/wet weight:	N/A	Analyst:	CHD
Ash/dry weight:	N/A	QC type:	DUP
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/26/2012 14:58	100.0	GQ2D	GVJ

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Alpha	1.76e+00	3.6e+00	2.8e+00	PCI/L	03/26/2012 14:58 CDT
Beta	4.49e+00	3.2e+00	4.8e+00	PCI/L	03/26/2012 14:58 CDT

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SDG #1200002

SAMPLE ANALYSIS REPORT

Sample #:	B2.02617K	QC batch #:	0008587R
Matrix:	WATER-DRINKING	Assay batch #:	0015841N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL GR-01
Dry/wet weight:	N/A	Analyst:	CHD
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	Aqueous		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/26/2012 16:39	100.0	GQ2A	GVJ

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Alpha	-7.68e-02	9.0e-01	8.3e-01	PCI/L	03/26/2012 16:39 CDT
Beta	-1.00e-01	1.0e+00	1.6e+00	PCI/L	03/26/2012 16:39 CDT

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SDG #1200002

SAMPLE ANALYSIS REPORT

Sample #:	B2.02617K	QC batch #:	0008587R
Matrix:	WATER-DRINKING	Assay batch #:	0015841N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL GR-01
Dry/wet weight:	N/A	Analyst:	CHD
Ash/dry weight:	N/A	QC type:	MS
Sample description:	N/A		
Comment:	Aqueous		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/26/2012 16:39	100.0	GQ2B	GVJ

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Alpha	6.80e+01	1.4e+01	8.2e-01	PCI/L	03/26/2012 16:39 CDT
Beta	6.33e+01	8.0e+00	4.4e+00	PCI/L	03/26/2012 16:39 CDT

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SDG #1200002

SAMPLE ANALYSIS REPORT

Sample #:	B2.02618L	QC batch #:	0008587R
Matrix:	WATER-DRINKING	Assay batch #:	0015841N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.500e-01 L	Analysis procedure:	NAREL GR-01
Dry/wet weight:	N/A	Analyst:	CHD
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/26/2012 16:39	100.0	GQ2C	GVJ

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Alpha	2.33e-01	2.5e+00	2.2e+00	PCI/L	03/26/2012 16:39 CDT
Beta	2.44e+00	2.1e+00	3.1e+00	PCI/L	03/26/2012 16:39 CDT

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SDG #1200002

SAMPLE ANALYSIS REPORT

Sample #:	B2.02619M	QC batch #:	0008587R
Matrix:	WATER-DRINKING	Assay batch #:	0015841N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.000e-01 L	Analysis procedure:	NAREL GR-01
Dry/wet weight:	N/A	Analyst:	CHD
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/26/2012 16:39	100.0	GQ2D	GVJ

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Alpha	-1.85e-01	1.8e+00	1.6e+00	PCI/L	03/26/2012 16:39 CDT
Beta	1.46e+00	1.6e+00	2.4e+00	PCI/L	03/26/2012 16:39 CDT

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SDG #1200002

SAMPLE ANALYSIS REPORT

Sample #:	B2.02675W	QC batch #:	0008587R
Matrix:	WATER-DRINKING	Assay batch #:	0015841N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	2.500e-01 L	Analysis procedure:	NAREL GR-01
Dry/wet weight:	N/A	Analyst:	CHD
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	Aqueous		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/26/2012 18:19	100.0	GQ2A	GVJ

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Alpha	-7.75e-02	9.1e-01	8.4e-01	PCI/L	03/26/2012 18:19 CDT
Beta	9.02e-01	1.1e+00	1.6e+00	PCI/L	03/26/2012 18:19 CDT

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SDG #1200002

SAMPLE ANALYSIS REPORT

Sample #:	B2.02676X	QC batch #:	0008587R
Matrix:	WATER-DRINKING	Assay batch #:	0015841N
Sample type:	SAM	Prep procedure:	N/A
Amount analyzed:	1.500e-01 L	Analysis procedure:	NAREL GR-01
Dry/wet weight:	N/A	Analyst:	CHD
Ash/dry weight:	N/A	QC type:	ANA
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/26/2012 18:19	100.0	GQ2B	GVJ

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Alpha	2.15e+00	2.7e+00	2.0e+00	PCI/L	03/26/2012 18:19 CDT
Beta	2.02e+00	2.1e+00	3.1e+00	PCI/L	03/26/2012 18:19 CDT

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SDG #1200002

SAMPLE ANALYSIS REPORT

Sample #:	LCS-00634195B	QC batch #:	0008587R
Matrix:	N/A	Assay batch #:	0015841N
Sample type:	N/A	Prep procedure:	N/A
Amount analyzed:	1.000e+00 SAMP	Analysis procedure:	NAREL GR-01
Dry/wet weight:	N/A	Analyst:	CHD
Ash/dry weight:	N/A	QC type:	LCS
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/26/2012 18:19	100.0	GQ2C	GVJ

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Alpha	1.81e+01	3.9e+00	3.0e-01	PCI	03/26/2012 18:19 CDT
Beta	1.57e+01	1.9e+00	1.1e+00	PCI	03/26/2012 18:19 CDT

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SDG #1200002

SAMPLE ANALYSIS REPORT

Sample #:	RBK-00634196C	QC batch #:	0008587R
Matrix:	N/A	Assay batch #:	0015841N
Sample type:	N/A	Prep procedure:	N/A
Amount analyzed:	1.000e+00 SAMP	Analysis procedure:	NAREL GR-01
Dry/wet weight:	N/A	Analyst:	CHD
Ash/dry weight:	N/A	QC type:	RBK
Sample description:	N/A		
Comment:	N/A		

COUNTING INFORMATION

Date and time	Duration (min)	Detector ID	Operator
03/26/2012 18:19	100.0	GQ2D	GVJ

ANALYTICAL RESULTS

Analyte	Activity	$\pm 2 \sigma$ Uncertainty	MDC	Unit	Date
Alpha	-3.21e-02	3.2e-01	2.8e-01	PCI	03/26/2012 18:19 CDT
Beta	1.47e-02	2.8e-01	4.5e-01	PCI	03/26/2012 18:19 CDT

**U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL AIR AND RADIATION ENVIRONMENTAL LABORATORY**

SDG 1200002

QC BATCH SUMMARY

QC batch #: 0008587R
Preparation procedure: N/A
Analysis procedure: NAREL GR-01

NAREL Sample #	QC Type	Yield (%)	$\pm 2 \sigma$ Uncertainty (%)	Analyst
B2.02559T	DUP	N/A		CHD
B2.02560K		N/A		CHD
B2.02561L		N/A		CHD
B2.02561L		N/A		CHD
B2.02617K	MS	N/A		CHD
B2.02617K		N/A		CHD
B2.02618L		N/A		CHD
B2.02619M		N/A		CHD
B2.02675W	LCS	N/A		CHD
B2.02676X		N/A		CHD
LCS-00634195B *		N/A		CHD
RBK-00634196C *		N/A		CHD
	RBK	N/A		CHD

* Samples marked with an asterisk are not in this sample delivery group but were analyzed with it for QC purposes.

National Air and Radiation Environmental Laboratory
QC Batch Report

QC Batch #: 0008587R

Analytical Method: NAREL GR-01

METHOD BLANKS (PCI)

Sample ID	Nuclide	Activity $\pm 2\sigma$	Prep Date	Flags
00634196C	ALPHA	$-3.21e-02 \pm 3.2e-01$	2012-03-22	OK
00634196C	BETA	$1.47e-02 \pm 2.8e-01$	2012-03-22	OK

LABORATORY DUPLICATES (PCI/L)

Sample ID	Nuclide	Original $\pm 2\sigma$	Duplicate $\pm 2\sigma$	RPD	Z
B2.02561L	ALPHA	$2.48e+00 \pm 3.9e+00$	$1.76e+00 \pm 3.6e+00$	33.73	-0.27 OK
B2.02561L	BETA	$2.29e+00 \pm 2.9e+00$	$4.49e+00 \pm 3.2e+00$	64.92	1.01 OK

MATRIX SPIKES (PCI/L)

Sample ID	Nuclide	Amt Added $\pm 2\sigma$	Native $\pm 2\sigma$	Measured $\pm 2\sigma$	%R	Z
B2.02617K	ALPHA	$6.96e+01 \pm 2.2\%$	$-7.68e-02 \pm 9.0e-01$	$6.80e+01 \pm 1.4e+01$	97.71	-0.22 OK
B2.02617K	BETA	$6.20e+01 \pm 2.2\%$	$-1.00e-01 \pm 1.0e+00$	$6.33e+01 \pm 8.0e+00$	102.12	0.32 OK

LAB CONTROL SAMPLES (PCI)

Sample ID	Nuclide	Amt Added $\pm 2\sigma$	Measured $\pm 2\sigma$	%R	Z
00634195B	ALPHA	$1.74e+01 \pm 2.2\%$	$1.81e+01 \pm 3.9e+00$	103.72	0.33 OK
00634195B	BETA	$1.55e+01 \pm 2.2\%$	$1.57e+01 \pm 1.9e+00$	101.24	0.19 OK

Analyst:

CH duBose
duBose, C H

29 March 2012

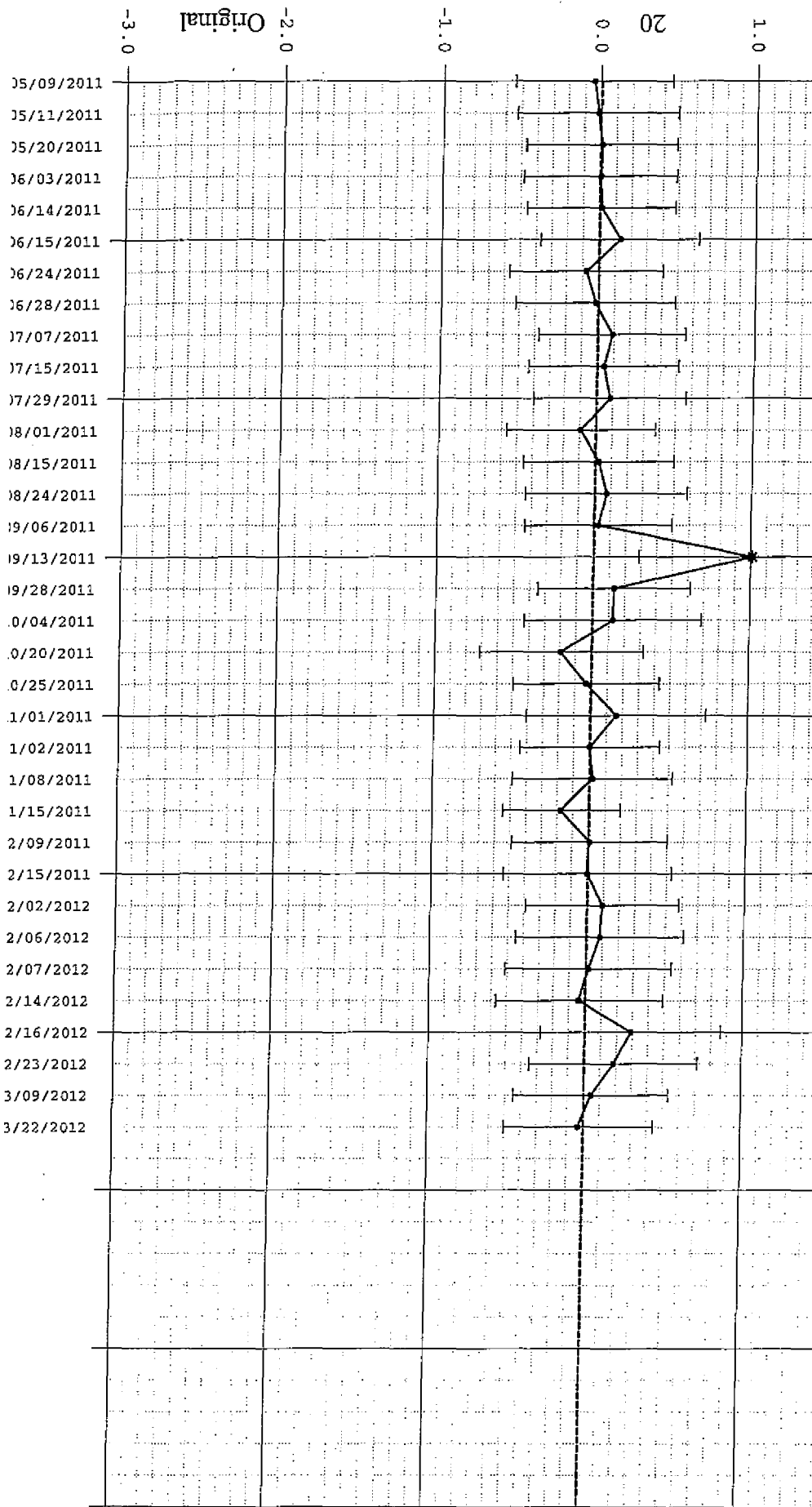
QA Officer:

Karl J McEwen

3/29/12

Method Blanks
Analyte: ALPHA
Method: NAREL GR-01
Analyst: duBose, CH

Report: 1200002-ALPBET



0.0

Method Blanks
Analyte: BETA
Method: NAREL GR-01
Analyst: duBose, C H

Report: 1200002-A₂PPBET

